

What is claimed is:

1. A method of producing a magnetic recording medium comprising:

a recording layer processing step, which by forming a plurality of grooves, with a minute spacing therebetween in a planar direction, in an intermediate from a production process for a magnetic recording medium produced by forming a continuous recording layer on top of a substrate surface, partitions said continuous recording layer into a plurality of partitioned recording elements;

a non-magnetic body filling step for filling said grooves between said partitioned recording elements with a non-magnetic body; and

a protective layer formation step for forming a protective layer that protects said partitioned recording elements and said non-magnetic body, wherein

said recording layer processing step is conducted with an environment surrounding said intermediate maintained in a state of vacuum.

2. The method of producing a magnetic recording medium according to claim 1, wherein

said recording layer processing step, said non-magnetic body filling step, and said protective layer formation step are conducted sequentially with an environment surrounding said intermediate maintained in a state of vacuum.

3. The method of producing a magnetic recording medium according to claim 1, wherein

a dry process cleaning step, which uses either one of a gas and a plasma for removing foreign matter from an environment surrounding said partitioned recording elements, is provided between said recording layer processing step and said non-magnetic body filling step.

4. The method of producing a magnetic recording medium according to claim 1, wherein

a smoothing step for smoothing a surface of said partitioned recording elements and said non-magnetic body is provided between said non-magnetic body filling step and said protective layer formation step.

5. The method of producing a magnetic recording medium according to claim 4, wherein

said smoothing step is a dry plasma step which allows ions to collide with a surface of said partitioned recording elements and said non-magnetic body at an incidence angle that is restricted to a value within either one of a range from -10 to 15° and a range from 60 to 90°.

6. The method of producing a magnetic recording medium according to claim 5, wherein said dry plasma step uses ion beam etching.

7. The method of producing a magnetic recording medium according to claim 1, wherein

in said recording layer processing step, said continuous recording layer is partitioned by reactive ion etching using carbon monoxide gas containing an added nitrogen based compound as a reactive gas.

- 5 8. The method of producing a magnetic recording medium according to claim 1, wherein

in said non-magnetic body filling step, said non-magnetic body is used to fill said grooves between said partitioned recording elements using either one of plasma CVD with bias  
10 power to said intermediate and bias sputtering.

9. The method of producing a magnetic recording medium according to claim 8, wherein

said non-magnetic body filling step uses a material comprising any one selected from the group consisting of an  
15 oxide material, a nitride material, and a non-magnetic amorphous material as said non-magnetic body.

10. The method of producing a magnetic recording medium according to claim 9, wherein

said non-magnetic body filling step uses silicon dioxide  
20 as said non-magnetic body.

11. The method of producing a magnetic recording medium according to claim 8, wherein

a barrier film formation step, which uses either one of a plasma CVD method and a sputtering method for forming a  
25 barrier film on said partitioned recording elements, is

provided between said recording layer processing step and said non-magnetic body filling step.

12. The method of producing a magnetic recording medium according to claim 11, wherein

5       said barrier film formation step forms a barrier film of diamond-like carbon.

13. A production apparatus for a magnetic recording medium comprising:

recording layer processing device, which by forming a  
10 plurality of grooves, with a minute spacing therebetween in a planar direction, in an intermediate from a production process for a magnetic recording medium produced by forming a continuous recording layer on top of a substrate surface, partitions said continuous recording layer into a plurality of  
15 partitioned recording elements; and

vacuum retention device, which houses said recording layer processing device, and maintains an environment surrounding said intermediate in a state of vacuum.

14. The production apparatus for a magnetic recording medium  
20 according to claim 13, wherein

non-magnetic body filling device for filling said grooves between said partitioned recording elements with a non-magnetic body, and protective layer formation device for forming a protective layer that protects said partitioned  
25 recording elements and said non-magnetic body are provided

inside said vacuum retention device.

15. The production apparatus for a magnetic recording medium according to claim 13, wherein

dry process cleaning device for removing foreign matter  
5 from an environment surrounding said partitioned recording elements using either one of a gas and a plasma is provided inside said vacuum retention device.

16. The production apparatus for a magnetic recording medium according to claim 13, wherein

10 barrier film formation device for forming a barrier film on said partitioned recording elements using either one of a plasma CVD method and a sputtering method is provided inside said vacuum retention device.

17. The production apparatus for a magnetic recording medium  
15 according to claim 13, wherein

smoothing device for smoothing a surface of said partitioned recording elements and said non-magnetic body is provided inside said vacuum retention device.